APPENDIX

ELIMINATING INFLATION BY 1995

Special Presentation to the FOMC
December 18, 1989

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Our presentation this afternoon will focus on identifying the probable macroeconomic consequences of an effort to stabilize the price level by 1995 through the application of monetary policy. We shall examine a set of alternative characterizations of the effects of central bank credibility on inflation and output, and we'll attempt to identify those lessons from our analysis that have the most direct bearing on your decisions.

Introduction

Your first exhibit provides a brief outline of our presentation. We'll begin with a discussion of the long-run relationship between money and prices, using the P-star model to illustrate a money path that is consistent with reaching price stability by 1995. From there, we will discuss the key features of the economy influencing the costs of disinflation, focusing on the difficulties of reducing inflation expectations and the related issue of establishing and maintaining the credibility of the central bank. We consider these issues with the aid of two econometric models that differ in the degree to which monetary policy announcements are viewed as credible by workers and firms. In addition to inflation expectations, many other elements of the economic environment might work for or against achieving price stability in the first half of the 1990s. We outline the consequences

for the economy of seeking zero inflation in the face of persistent downward pressure on the foreign exchange value of the dollar, a jump in world oil prices, and a looser-than-expected fiscal policy. Finally, we discuss some strategic issues surrounding the achievement of price stability by 1995. In particular, we compare a policy that slows the economy sharply in the near term and then produces a gradual lowering of the unemployment rate, with an alternative policy that leads to a smaller increase in the unemployment rate but one that is more persistent.

Your second exhibit places the notion of price stability in some historical perspective. The upper panel plots the level of the consumer price index since 1913, the year the Federal Reserve System was founded. The lower panel plots the corresponding inflation rate. The historical record suggests that even rough approximations to price stability have not occurred with great frequency. In the past 75 years, there have been three periods of approximate sustained price stability--shown by the shaded areas. The first two episodes occurred between the world wars. Over the period from 1922 to 1929, there was virtually no net change in the price level, and from 1934 to 1940 the average increase in the price level was less than one percent per year. However, as seen in the lower panel, there was considerable variation in annual inflation rates, which fluctuated between positive 5 percent and negative 4 percent during these intervals. In the post-World War II period, inflation was fairly low and relatively stable between 1951 and 1965--averaging just 1-1/2 percent annually and varying between minus

3/4 percent and plus 4 percent. Of course, even the low rates of inflation during the 1951 to 1965 interval led to a substantial cumulative rise in the price level of more than 20 percent.

Money and Prices: The P-Star Model

Although the year-to-year fluctuations evident in inflation can be caused by a variety of supply and demand disturbances, over the longer haul, a persistent rise in the price level is a phenomenon that cannot occur without at least the acquiescence of the monetary authority. Monetary theory maintains that, while money growth may cause short-run movements in real output, in the long run, money only affects the price level--with fundamental real forces, such as population growth and productive efficiency governing the expansion of real output. The P-star model, outlined in the upper panel of exhibit 3, embodies this theory and provides a convenient framework for summarizing the observed dynamics of the relationship of money and prices. P-star--shown in equation 1--is defined as the equilibrium price level associated with a given stock of M2. It is calculated under the assumption that M2 velocity is at its long-run average and that output is at its potential level, measured by the level of real GNP associated with the natural rate of unemployment.

Equation 2 of the P-star model tells us how the system will adjust if disturbed from long-run equilibrium. The model suggests that when P-star is above the actual price level, there is a tendency for inflation to increase as the price level moves toward its equilibrium. This correlation can be seen in the bottom two panels. The shaded areas

highlight periods when P-star was above P and inflation generally was rising. In the unshaded intervals, P-star was below P and, for the most part, inflation was easing, with the period from 1979 to 1985 the most notable episode of disinflation. At present, the price level is close to its estimated equilibrium, and the model is not pointing to any significant change in inflation.

In exhibit 4, we use the P-star model to solve for a path of M2 growth that yields an inflation rate close to zero in 1995. Starting in the upper panel, we used the staff projection for the growth of M2 during 1990 and 1991 and then trimmed money growth a bit further over the remainder of the projection horizon. As seen in the middle panel, the slowing growth of money creates a widening gap between P and P-star. According to the model, that price gap places gradual downward pressure on the inflation rate--shown in the lower panel.

One of the principal messages of this model is that, given the long lags between money growth and inflation, a five-year horizon is short, if the goal is a gradual elimination of inflation from current levels. Given the inertia in inflation that is implied by the estimated coefficients of this model, any significant delay in the slowing of M2 growth from that shown in this simulation would have required a much sharper tightening of policy later to reach price stability by 1995.

The primary shortcoming of the P-star model for the purposes of today's discussion is that it provides no insight into the consequences of monetary policy beyond its probable effect on inflation, with the

most notable unobserved consequence being the output loss that might be associated with eliminating inflation. The model doesn't imply the absence of such costs, it simply lacks the ancillary structure to describe them.

Expectations and the Costs of Disinflation

The upper panel of exhibit 5 lays out a few factors influencing the costs of disinflation. In general, output losses arise when the wage- and price-setting behavior of workers and firms is not fully consistent with the current actions and announced intentions of the monetary authority. Rigidities in prices and wages that can prevent instantaneous adjustment to changes in monetary policy may take many forms. One is legal contracts, such as collective bargaining agreements or supply arrangements. Another is the costs associated with changing prices, which may be as obvious as the expense of printing new catalogs, menus or price lists. Finally, there are decision lags, which reflect the time required to set new prices in response to changes in the economic environment.

But perhaps a more pervasive question is how rapidly and through what channels do inflation expectations adjust to changes in monetary policy. Even absent the rigidities noted above, wages and prices will exhibit a good deal of inertia if past patterns of price movements are expected to persist. A reduction in the growth of money that is not accompanied by a proportionate reduction in inflation expectations is likely to have negative effects on output.

Some gauge of the current degree of tension between people's expectations of future inflation and the goal of price stability is provided by available survey data. In the middle panel, we have plotted the results of the Hoey survey for both ten-year-ahead inflation expectations--the short dashes--and one-year-ahead inflation expectations--the long dashes, as well as actual consumer price inflation--the solid line. For most of this decade, long-term inflation expectations have exceeded short-term expectations and actual inflation, suggesting that respondents anticipated a rise in inflation over the longer run. In that regard, an encouraging feature of recent survey results has been the further gradual drop in long-term inflation expectations since 1987, a period in which actual and expected short-term inflation edged up. This drop has brought long-term expectations down to roughly the current rate of inflation, perhaps pointing to confidence among market participants that the FOMC will act to prevent any significant acceleration of inflation.

By the same token, the survey evidence also suggests that those individuals polled do not expect the FOMC gradually to eliminate inflation. Inflation over the next ten years still is expected to average about 4-1/4 percent annually, with little difference anticipated between the first and second five-year periods.

Given the considerable gap between current expectations and the goal of price stability, a key question becomes one of how these inflation expectations can be reduced. We can't provide a definitive answer to this question. Instead, we shall present several hypotheses

about how expectations are formed, examine their implications, and gauge their likelihood by looking at relevant historical evidence.

With the Federal Reserve playing a crucial role in the longer-term behavior of the price level, the lower panel suggests three possible interactions between the policy of the FOMC and the formation of inflation expectations. One hypothesis might be that FOMC announcements have complete credibility with all wage and price setters, so that inflation expectations promptly fall into line with announced FOMC intentions both for the present and for the future. Another hypothesis might be that people observe and respond to the actions of the FOMC, but are unwilling to alter their current behavior on the basis of announcements of future policy plans. A third hypothesis might be that people reduce their inflation expectations only when they see actual progress toward lower inflation. These alternatives span a fairly broad spectrum of possibilities, but do not capture all of the subtleties that likely are associated with how workers and firms anticipate, learn of, and respond to changes in policy. In particular, the degree of central bank credibility could change over time, as individuals learn whether the FOMC follows through on its announcements.

Forward-Looking Model

To explore the implications of some of these hypotheses, we have employed an experimental model with forward-looking expectations developed in the Division of International Finance. This model--outlined in your next exhibit--incorporates so-called "rational expectations"; that is, it assumes individuals are forward looking and

understand the structure of the economy well enough to anticipate correctly the consequences of monetary policy for inflation and output. Another important underlying assumption of the model is that staggered wage and price contracts create rigidities that prevent an immediate adjustment of prices to unexpected changes in monetary policy.

We use the model to examine two cases that differ in the degree of central bank credibility. In one case, labeled "strong credibility," we have assumed that, during the first two years of a deceleration of money, people expect the FOMC to permanently hold money growth at the lower rates of increase that are actually observed, but do not act on the FOMC's announcement of future reductions in money growth. However, after witnessing two years of monetary deceleration in line with previous FOMC announcements, people come to believe that the FOMC will carry out the plans it has announced for future years and, therefore, are willing to alter wage and price setting today on the basis of announced future changes in monetary policy. In essence, the FOMC, by acting on its announcements in the first two years, is assumed to earn full credibility for its subsequent longer-range policy announcements. In the second case, labeled "weak credibility," it is assumed that people believe that the FOMC will hold to current money growth rates in the future, but are not willing to alter current behavior on the basis of announced future policies. In this case, credibility must be earned year by year through demonstrated policy action.

In order to perform these simulations, as well as others that we undertake in our presentation, we have made a number of additional

assumptions about other key variables. First, we have assumed that, in the absence of any significant change in real interest rates from current levels, the foreign exchange value of the dollar in real terms would remain constant. Second, we have held the real price of oil at its current level over the projection interval. And finally, we have assumed that the full-employment budget deficit is reduced from over $160 billion now to near zero by 1996.

Your next chart displays the effects on inflation, output, and unemployment of alternative assumptions concerning central bank credibility. In both cases, we assume that the FOMC announces in advance its intention to slow money growth to rates consistent with attaining price stability by 1995. Under strong credibility, shown as the long dashes in the panels, inflation falls rapidly--hitting about 2-3/4 percent in 1991 and close to zero by 1992. Growth in real GNP slips a bit below potential in 1990 and 1991, but moves a bit above potential, thereafter. The unemployment rate peaks at nearly 6 percent in 1991 and drops back to an assumed "natural rate" of 5-1/2 percent by 1994. All told, there are small losses in output in the interval during which the FOMC is establishing its credibility and virtually no losses beyond that period.

In the case of weak credibility--shown by the short dashes--inflation slows more gradually over the projection interval. In this case, because wage and price setters are unwilling to alter their current behavior before seeing the actual implementation of monetary policy, the continued reductions in money growth are not anticipated and

acted on in advance. The consequence is that growth in real GNP is weaker and the unemployment rate higher than in the case of strong credibility. In this simulation, growth in output remains a bit below potential throughout the period, and the unemployment rate drifts up to near 6-1/4 percent by 1995.

The potent effects of inflation expectations and the degree of credibility of the monetary authority in this model rest on a number of strong assumptions about economic behavior. Larry Slifman now will present some simulation results using the Board's large-scale econometric models, which contain a different hypothesis about expectations and credibility.

Zero Inflation Base Case

Your next exhibit, titled "zero inflation base case," shows the results of a simulation derived by combining the results of two large-scale econometric models used by the Board's staff--the MPS quarterly econometric model of the U.S. and the multicountry model. For convenience, however, I shall refer to this combination as the Board model. Both the Board model and the forward-looking model that Dave just discussed have a similar structure, except that in the Board model individuals do not change their expectations about inflation until they see a change in the actual inflation rate. Consequently, in the Board model credibility plays no direct role, as monetary policy influences expectations only by affecting actual inflation.

Comparing the upper and lower panels on the left, you can see that in this simulation, a steady slowing of inflation can be achieved

without a recession. We will use this simulation as the base case for examining alternative scenarios later in our presentation. Looking now at the results of this simulation more closely, the steady slowing of inflation is achieved by raising the unemployment rate over the next two years to about the 7 percent neighborhood, and maintaining labor market slack close to that level through 1995. Accompanying this unemployment path would be a slowing of real GNP growth to an average of a little under 1 percent annually during the next two years or so, followed by a pickup to the neighborhood of potential GNP growth through the mid-1990s.

Achieving such a path for real GNP would require a slowdown in the growth of M2 during the early 1990s. Consistent with the monetary restraint on aggregate demand over the next few years, some increase in real interest rates would be likely. Later in the period, monetary restraint would have to be eased in order to prevent further increases in unemployment, and real interest rates would decline. I should note that the entire path of real rates shown in the exhibit is held down somewhat--reflecting our assumption of a shrinking budget deficit. Peter Hooper will have more to say on the role of fiscal policy in a few minutes.

The critical point to draw from this simulation and the simulations based on the forward-looking model is the link between the costs of eliminating inflation and the speed with which inflation expectations change: the more people tend to adjust their inflation expectations before prices actually change--that is, the more policy is

believed in advance of results and expectations are forward looking--the lower will be the costs of disinflation.

Sacrifice Ratios

At this point, a natural question to ask is "which of these model simulations is more realistic?" One approach to answering this question is to compare the sacrifice ratios implied by the models with historical ratios. This is shown in exhibit 9. The sacrifice ratio is arrived at by dividing the amount of disinflation during a particular time period--measured in percentage points--into the cost of that disinflation--measured as the cumulative difference over the period between the actual unemployment rate and the natural rate of unemployment. Thus, it is a measure of the amount of excess unemployment over a year's time associated with each one percentage point decline in the inflation rate. The larger the sacrifice ratio, the greater the cost for each percentage point of disinflation. For example, assuming that the natural rate of unemployment during the next five years will be roughly 5-1/2 percent, the strong credibility simulation presented by Dave suggests that reducing inflation by nearly 4 percentage points will cost seven-tenths of a percentage point in terms of excess unemployment, for a sacrifice ratio of 0.2, while the weak credibility simulation has a sacrifice ratio of 0.6. In contrast, the sacrifice ratio implied by the Board model simulation--2.2--is several times larger.

Lines 4 to 7 of the table show sacrifice ratios in the United States calculated for the four periods of disinflation since the end of

the Korean war. During three of the periods, the sacrifice ratio was about 2 or more. The exception was the 1970 to 1972 period, when the costs were contained (if only temporarily) by the imposition of wage and price controls in August 1971. Finally, for purposes of comparison, lines 8 to 12 show sacrifice ratios for five other industrialized countries; despite the wide variety of institutional arrangements and of purported degrees of policy credibility in these countries, the ratios generally tell a story about the historical costs of disinflation similar to that for the United States.

Thus, the historical experience suggests that apart from incomes policies or other controls, which have their own problems, the use of macroeconomic policies to reduce inflation does involve costs, and those costs are of an order of magnitude consistent with the simulation results from models in which inflation expectations do not adjust in advance of actual inflation. It seems quite possible that over time an announced disinflation policy that had established some successes might begin to have a perceptible effect on expectations, and sacrifice ratios might be less than those observed in the past. Nonetheless, the Board model comports well with the historical evidence on sacrifice ratios and would seem to be a useful starting point for measuring the costs of disinflation.

Realism of the Models

Of course, other questions remain about the realism of our econometric simulations. In particular, as noted on the top panel of your next exhibit, many analysts have suggested that such phenomena as

increased global competition, heightened efficiency and cost consciousness on the part of business, and the diminished strength of labor unions may have fundamentally changed the way wages and prices are determined in the United States. Thus, it might be argued that an econometric model estimated using historical data would not adequately predict future price developments, and that the sacrifice ratio in the 1990s could be lower than in the past.

The lower panel addresses this issue in a simple way, although in other work the Board's staff has performed a more rigorous analysis with the same basic results. The exhibit shows actual inflation--the solid line--and a forecast generated by a version of the price and wage sector of the Board model estimated using data only through 1979; so that what we are showing is an out-of-sample forecast. If there had been a fundamental change in the wage and price determination process during the 1980s that was not captured by the model, then we would expect to see large, persistent errors in the out-of-sample forecasts. As you can see, however, the model has tracked actual inflation reasonably well during the past decade. To be sure, there have been some large errors--notably in 1984--but they have dissipated within a couple of years, and the model has been right on track recently. This suggests that any effects of structural changes in labor and product markets already are captured in the model by their effects on unemployment, productivity, and inflation expectations.

Another issue related to the realism of the model simulations is the question of financial strains and financial fragility. For

example, Chairman Greenspan in his appearance before Representative Neal's subcommittee said that efforts to eliminate inflation could produce a "major financial crunch" unless they are accompanied by a significant reduction in the federal deficit. Frankly, apart from providing us with a rough and uncertain guide to the likely path of interest rates, our models are not equipped to shed much light on this issue. Clearly, a combination of higher real rates and weaker economic growth is not a hospitable environment for highly leveraged firms or households--especially those with short-term or floating rate debt. But whether cash flow strains or actual defaults would result in different patterns of spending behavior than observed in past cycles isn't entirely clear. For example, it is often argued that institutional and legal changes make restructuring of financial obligations easier. Nonetheless, one cannot rule out the possibility that a higher rate of defaults could influence confidence more generally and have broader systemic effects.

With this caveat in mind, we now turn to Peter Hooper, who will discuss the effects of several possible impediments to achieving zero inflation over the next five years.

Alternative Exchange Rate Assumption

The estimates of the costs of reaching zero inflation that Dave and Larry have discussed assume that economic conditions over the next five years will be relatively favorable for achieving that goal. As was noted earlier, we have assumed that there will be no autonomous drop in the foreign exchange value of the dollar, that there will be no adverse

supply shocks, and that we will continue to see steady progress toward balance in the federal budget. Of course, there is always the chance that something will go wrong along the way. I shall consider how the monetary restraint needed to eliminate inflation and its associated effects might be influenced by less favorable outcomes for some of these variables. In doing so, I'll be presenting estimates based on simulations with the Board model that Larry discussed.

The first less favorable assumption concerns exchange rates, as shown in exhibit 11. In the base-case disinflation scenario we assumed that dollar exchange rates would not be directly influenced by the U.S. external deficit. That is, exchange rates were assumed to move principally in response to changes in interest rates and inflation rates. As indicated by the solid line in the top panel, the dollar appreciates for several years in the base case as anti-inflationary monetary policy pushes real interest rates in the United States up relative to rates abroad. The base-case scenario also projects a persistent U.S. external deficit, which is assumed not to affect the dollar.

At some point, however, the mounting U.S. external debt to foreigners could begin to influence the willingness of international investors to hold additional dollar assets. As you know, this has been one of the tenets of our Greenbook exchange rate projection, and it is the basis for the alternative shown by the dashed line. Under the assumption that the willingness to accumulate dollar assets declines over time, the average value of the dollar against G-10 currencies falls

at a rate of about 6 percent per year relative to the base-case path, reaching a level nearly 30 percent below that path by 1995.

The lower dollar exchange rates have a significant inflationary effect through both higher import prices and increased demand pressures created by stimulus to net exports. In order to offset these additional pressures on inflation while still achieving the objective of zero inflation by 1995, money growth is tightened more than in the base case. One index of the extra monetary restraint is the greater increase in real interest rates relative to the base-case path. This can be seen by comparing lines 1 and 2 in the panel below, which show that by 1995, the real Treasury bill rate, at a level of 7 percent, is 3 percentage points above the base case.

The rise in real interest rates depresses private domestic expenditures, especially investment, by enough to more than offset the stimulus to net exports from the lower dollar. Real GNP growth, line 3, falls somewhat relative to the base case, particularly during the last three years of the simulation period, and the unemployment rate (line 5) rises above the base case, to a range of 7-1/2 to 7-3/4 percent after 1992. In this scenario, the additional degree of slack in the economy is needed to offset the inflationary effects of rising import prices.

The weaker dollar does result in a significantly lower current account deficit measured as a percent of nominal GNP, as shown in line 7. By 1995, the improvement in the current account relative to the base case amounts to 1 percent of GNP or roughly $70 billion. This improvement would be noticeably greater if the higher interest rates in

this scenario were not also raising U.S. debt service payments to the rest of the world.

Supply Shocks

Your next exhibit presents the effects of a representative supply shock. Our base-case assumption (the solid line in the exhibit) is that oil prices in real terms remain unchanged. Deviations from this assumption are plausible in both directions. However, the growing concentration of world oil production and reserves in OPEC countries and prospects for continued growth of demand in consuming countries raise the possibility of an upward adjustment in the relative price of oil at some point. Our alternative assumption here is that real oil prices double between 1992 and 1994, and remain unchanged thereafter. This is a very large increase, but still leaves the real price of oil $6 per barrel below its average during the first half of the 1980s.

Achieving zero inflation in the face of higher oil prices again requires some additional monetary restraint. As indicated in line 1 in the table below, by 1995, the real Treasury bill rate is pushed up one percentage point above the base case. The oil price shock also results in significantly weaker domestic activity. From 1992 on, real GNP growth (line 3) remains noticeably below the path in the base case. And the unemployment rate (line 5) eventually rises to 8 percent.

Alternative Fiscal Policy

The third alternative assumption we consider is fiscal policy, as shown in exhibit 13. Our base-case assumption (shown by the solid line) is that the full-employment budget deficit will decline steadily,

through reduced government expenditures, to zero by 1995. Recent geopolitical developments and the resultant possibility of deep cuts in defense expenditures suggest that this path might now be more easily attained. But with many potential competitors for any "peace dividend," it is worthwhile to consider an alternative case in which the full employment deficit remains unchanged as a share of GNP. Here we assume that the deficit persists at about 2-1/2 percent of GNP, or roughly $130 billion at current income levels.

In contrast to the examples of a weaker dollar and higher oil prices, the easier fiscal policy in this scenario affects inflation primarily through its stimulus to aggregate demand. Achieving zero inflation, therefore, requires raising real interest rates enough to offset that stimulus and keep GNP and the unemployment rate roughly unchanged from their base-case paths. The simulation results in lines 1 and 2 below show real short-term rates rising steadily above the base case, and by 1995 exceeding the base-case path by 2-1/2 percentage points.

While the level of total output is not greatly affected in this scenario, the combination of fiscal stimulus and higher interest rates does produce a significant shift in the composition of GNP. In order to make room for the higher level of government expenditures at unchanged GNP, housing, business fixed investment, and net exports are crowded out strongly.

The actual budget deficit in this scenario (shown in line 7) rises well above the assumed full-employment level of 2-/1/2 percent of

GNP. This is because of both the shortfall of GNP from potential and the high real interest rates associated with the move to zero inflation. Even at a level of 4.6 percent in 1995, however, the ratio of the deficit to GNP would still be less than its peak levels of earlier in the 1980s.

Summary of Alternative Scenarios

The alternative scenarios we chose to present here involved less favorable circumstances, in part because more difficult decisions would have to be made if something goes wrong than would be the case if events turn out more favorably than expected. One also could argue that the odds are somewhat greater on the negative side at this juncture. Nevertheless, there is some chance that we could see a stronger dollar, a fall in real oil prices, or even, with some stretch of the imagination, a budget surplus. To a first approximation, the estimated effects of the shocks presented here could be reversed in sign if one wished to estimate the implications of a correspondingly more favorable set of outcomes.

A summary of the simulated costs of achieving zero inflation under the alternative scenarios I have discussed is presented in exhibit 14. The first column of numbers shows the cumulative shortfall of the level of GNP from potential over the next six years, expressed as a percent of potential GNP. The second column shows the cumulative excess of unemployment relative to an assumed natural rate of 5-1/2 percent, and the third column shows sacrifice ratios, which were

calculated by dividing the numbers in column 2 by the 3.9 percentage point reduction in inflation over the period.

Relative to the base case (shown in line 1), achieving zero inflation with the weaker dollar (line 2) involves a greater loss of output and employment and a higher sacrifice ratio. Losses in the scenario with higher oil prices (line 3) are greater still. Nevertheless, the differences between these two scenarios and the base case are considerably smaller than the estimated costs of disinflation under the base case itself. The costs associated with the unchanged budget deficit scenario do not differ appreciably from the base case, and if anything, appear to show slightly smaller losses in employment. Keep in mind, however, that the level of private investment is depressed in this case, which would have more negative implications for the longer run.

Let me turn the presentation back to Larry now for some closing remarks.

Strategic Issues

In closing our presentation, I would like to touch on a key strategic issue. As shown by the solid lines in your final exhibit, although the base-case simulation produces a steady deceleration of inflation throughout the first half of the 1990s without generating a recession, it ends with the unemployment rate at 7 percent in 1995--roughly 1-1/2 percentage points above our estimate of the natural rate of unemployment. If unemployment were to remain at that level, in fairly short order it would lead to outright deflation. Thus, in the

case of a gradual deceleration of inflation with no credibility effects, the economy would continue to pay a price beyond the five-year horizon in the form of excess unemployment and deflation.

Consequently, we conducted an alternative experiment. In this simulation, we used the Board model and searched for a money path that would both produce approximately zero inflation in 1995 and also return the unemployment rate to a level close to the natural rate. The results of this simulation are shown by the dashed line in the exhibit. This alternative experiment requires a more aggressive tightening of monetary policy early on, and generates a small recession in 1990. As a consequence, the unemployment rate peaks in 1992 at a level about one percentage point higher than in the base case, but then falls rapidly during the subsequent three years. In the scenario, the sacrifice ratio would be about 2-1/2, only a bit higher than the 2.2 ratio in the base-case scenario. I should note that the upward movements in real interest rates in both of these simulations would cause the dollar to appreciate, which would augment the disinflationary forces emanating from reduced domestic cost pressures.

Conclusion

We have presented a large number of simulations this afternoon based on three different models. At this point you probably are wondering: what is the bottom line of our presentation? We can't give you a single bottom-line answer, since the acceptance or rejection of a particular simulation depends on one's views about such things as credibility effects and the way expectations are formed, and on one's

willingness to accept a possible recession, among other things. However, the one thing we can say is that all of the models and simulations indicate that if inflation is to be eliminated within five years, money growth will have to slow. Moreover, unless credibility effects are quite strong, the slowdown in the growth rate of money will generate higher real rates and a sizable increase in unemployment. Indeed, under most scenarios, increases in the unemployment rate of about a tenth of a percentage point per month could be expected for at least the next year or two.